	Application No.	Applicant(s)	
Notice of Allowability	10/705,498	GEORGE ET AL.	
	Examiner	Art Unit	
	Scott L. Jarrett	3623	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *Applicants remarks of 5/20/05 and examiner's amendment discussed 8/3/05 and 8/5/05* .

2. ☒ The allowed claim(s) is/are *1 and 4-12*.

3. ☒ The drawings filed on *10 November 2003* are accepted by the Examiner.

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a) ☐ All   b) ☐ Some*   c) ☐ None   of the:

       1. ☐ Certified copies of the priority documents have been received.

       2. ☐ Certified copies of the priority documents have been received in Application No. _____ .

       3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

    * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application. **THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.

    (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached

       1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____ .

    (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of

       Paper No./Mail Date _____ .

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)

2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)

3. ☒ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _____

4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material

5. ☐ Notice of Informal Patent Application (PTO-152)

6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .

7. ☒ Examiner's Amendment/Comment

8. ☒ Examiner's Statement of Reasons for Allowance

9. ☐ Other _____ .

Susanna Diaz

SUSANNA M. DIAZ
PRIMARY EXAMINER
AU 3623

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes

and/or additions be unacceptable to applicant, an amendment may be filed as provided

by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be

submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview

with Michael Martin (Reg. No. 24,841) on August 3, 2005 and August 5, 2005.

Amendments to the Claims:

This listing of claims will replace all prior versions and listings of claims in this application.

Listing of Claims:

Claim 1. (currently amended) A computer implemented method for reducing the work in process at a given time in the manufacture of one of a product and a series of products by comparing process activity parameters including process setup time and process time per product unit, with the number of different product part numbers processed, changing at least one of said process activity parameters to reduce said work in process, said method including the steps of:

determining, by a computer, the aggregate demand in product units per hour based on the number of different product units produced at a facility multiplied by the customer demand rate for respective product units per hour;

determining, by a computer, the common minimum batch size for all product units (MINB) for all workstations from the equation:

$$MINB = \lambda \left[\frac{\sum_{i=1}^{N} S}{1 - \sum_{i=1}^{N} \lambda P} \right] = \frac{\Lambda S}{1 - \Lambda P}$$

where λ is the customer demand rate, N is the number of different product part numbers (from i to N), Λ is the aggregate demand for all product units produced in the facility, S is the setup time required to prepare a workstation to produce a batch of product units and P is the time required to process one product unit at the workstation in question; and

reducing said work in process by selective reduction of at least one of said product part numbers, said process setup time and said process time per product unit.

Claim 2. (canceled)

Claim 3. (canceled)

Claim 4. (currently amended) The method set forth in Claim [3] 1 including the step of:

comparing the non value added cost of process time per product unit with the number of product part numbers being processed.

Claim 5. (previously presented) The method set forth in Claim 4 including the step of:

determining the common workstation turnover time (WTT) for all workstations processing N product part numbers from the equation:

$$WTT = \frac{NS}{1 - \Lambda P}$$

wherein all product units have the same demand, setup time and process time per product unit.

Claim 6. (original) The method set forth in Claim 5 including the step of:

comparing the non value added cost of defective product units with the number of product part numbers being produced.

Claim 7. (original) The method set forth in Claim 5 including the step of:

comparing the non value added cost of demand in product units per unit of time with the number of product part numbers being processed.

Claim 8. (previously presented) The method set forth in Claim 5, including the step of:

determining the average total system inventory in a facility for perfectly synchronized average Work In Process from the equation:

$$\left[\frac{(\Lambda P)J\Lambda S}{1 - \Lambda P} \right] + \left[\frac{N\Lambda S}{2(1 - \Lambda P)} \right]$$

wherein all product units have the same demand, setup time and process time per product unit.

Claim 9. (previously presented) The method set forth in Claim 5 including the step of:

determining the average total system inventory in a facility for setup-on-batch-arrival average Work In Process from the equation:

$$\left[\frac{J\Lambda S}{1-\Lambda P}\right]+\left[\frac{N\Lambda S}{2(1-\Lambda P)}\right]$$

wherein all product units have the same demand, setup time and process time per product unit.

Claim 10. (previously presented) The method set forth in Claim 5 including the step of:

determining the average total system inventory in a facility for fully asynchronized average Work In Process from the equation:

$$\left[\frac{NJ\Lambda S}{1-\Lambda P}\right]+\left[\frac{N\Lambda S}{2(1-\Lambda P)}\right]$$

wherein all product units have the same demand, setup time
and process time per product unit.

Claim 11. (currently amended) A <u>computer</u> <u>implemented</u> method
for reducing the work in process at a given time in the
manufacture of one of a product and a series of products by
comparing process activity parameters including process setup
time, processing time per product unit and the number of
different product part numbers processed, at one or more
workstations, including the steps of:

determining<u>, by a computer,</u> maximum workstation turnover
time to produce one minimum size batch of each product at each
workstation (WTT_{max}) from the equation:

$$WTT_{max} = \underset{j=1,J}{Max}\left[\frac{\sum_{i=1}^{N}S_{ij}}{1-\sum_{i=1}^{N}\lambda_{i}P_{ij}}\right]$$

wherein, i = part product index (i = 1, …, N) and N is the
total number of different parts or products, j equals the
workstation (j = 1,…, J), J is the number of distinct
workstations, λ_i is the customer demand rate for part product i
in units per hour, S_{ij} is the setup time required to prepare
workstation j to produce a batch of part/product i and P_{ij} is the

time required to process one unit of part/product i at workstation j; and

changing selected ones of said process activity parameters to reduce said workstation turnover time.

Claim 12. (currently amended) A <u>computer</u> <u>implemented</u> method for reducing the work in process at a given time in the manufacture of one of a product and a series of products by comparing process activity parameters including process setup time, processing time per product unit and the number of different product part numbers processed, at one or more workstations, including the steps of:

determining$_{\underline{L}}$ <u>by</u> <u>a</u> <u>computer,</u> the batch size (MINB$_i$) for N products from the equation:

$$MINB_i = \lambda_i WTT_{max} = \lambda_i \underset{j=1,J}{Max} \left[\frac{\sum\limits_{i=1}^{N} S_{ij}}{1 - \sum\limits_{i=1}^{N} \lambda_i P_{ij}} \right]$$

wherein, i = part product index (i = 1, ..., N) and N is the total number of different parts or products, j equals the workstation (j = 1,..., J), J is the number of distinct workstations, λ_i is the customer demand rate for part product i in units per hour, S_{ij} is the setup time required to prepare workstation j to produce a batch of part/product i and P_{ij} is the

time required to process one unit of part/product i at

workstation j; and

changing selected ones of said process activity parameters

to reduce said work in process.

Claim 13. (canceled)

REASONS FOR ALLOWANCE

The following is an examiner's statement of reasons for allowance.

The present invention is directed to a computer-implemented method for reducing the amount of total minimal inventory for finished and work in process goods for a series of products based on a set of deterministic equations that relate the complexity of a product line (e.g. the number of different product part numbers) or service process to a plurality of process activity parameters (e.g. process setup time, process time per product), aggregate demand, common minimum batch size and/or workstation turnover time.

The closest prior art George et al. (U.S. 5,195,041), Hoehn et al. (Robust Design Through Design to Six Sigma Manufacturability) and Bolch et al. (Queuing Networks and Markov Chains) fail to teach, either singularly or in combination, reducing the work in process through the application of the following specific equations:

$$MINB = \lambda \left[\frac{\sum\limits_{i=1}^{N} S}{1 - \sum\limits_{i=1}^{N} \lambda P} \right] = \frac{\Lambda S}{1 - \Lambda P} \quad \text{(Claim 1)}$$

$$WTT_{max} = \underset{j=1,J}{Max} \left[\frac{\sum\limits_{i=1}^{N} S_{ij}}{1 - \sum\limits_{i=1}^{N} \lambda_i P_{ij}} \right] \quad \text{(Claim 11)}$$

$$MINB_i = \lambda_i WTT_{max} = \lambda_i \underset{j=1,J}{Max} \left[\frac{\sum\limits_{i=1}^{N} S_{ij}}{1 - \sum\limits_{i=1}^{N} \lambda_i P_{ij}} \right] \quad \text{(Claim 12)}$$

More specifically George et al. teach determining material flow rates based on customer demand (shipment schedule) and batch sizes necessary to meet the aggregate demand however George et al. ('041) does not teach reducing the amount of work in process through the application of the equations discussed above and as claimed in independent claims 1, 11 and 12 respectively.

Hoehn et al. teach the application of well-known Six Sigma techniques to the design for manufacturing process wherein product complexity and a plurality of other factors are taken into account to ensure that products are designed to be cost effective and manufacturable (e.g. not overly complex) however Hoehn et al. does not teach reducing the amount of work in process through the application of the equations discussed above and as claimed in independent claims 1, 11 and 12 respectively.

Bolch et al. teach evaluating and improving manufacturing processes through modeling the processes as queuing network models wherein the models include equations for determining common workstation turnover time and average total system inventory however Bolch et al. does not teach reducing the amount of work in process through the application of the equations discussed above and as claimed in independent claims 1, 11 and 12 respectively.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably

accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Scott L. Jarrett whose telephone number is (571) 272-7033. The examiner can normally be reached on Monday-Friday, 8:00AM - 5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hafiz Tariq can be reached on (571) 272-6729. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SJ
8/5/2005

SUSANNA M. DIAZ
PRIMARY EXAMINER
AU 3623